CLAIMS

Therefore, having thus described the invention, at least the following is claimed.

1. A microstructure, comprising:

a substrate;

an overcoat layer disposed upon the substrate;

an air-region within at least a portion of the overcoat layer; and

a framing material layer engaging at least a portion of the air-region on an inside surface of the framing material layer, and engaging the overcoat layer on an outside surface of the framing material layer.

2. The microstructure of claim 1, wherein the overcoat layer is selected from polyimides, polynorbornenes, epoxides, polyarylenes ethers, polyarylenes, inorganic glasses, and combinations thereof.

3. The microstructure of claim 1, wherein the framing material is selected from SiO_2, Si_3N_4, SiO_xN_y (where x is from 0.01 to 2 and y is from 0.01 to 1.33), and Al_2O.

4. The microstructure of claim 1, wherein the air-region has a height from about 0.01 to 100 micrometers and a width of about 0.1 to 10,000 micrometers.

5. The microstructure of claim 1, wherein the framing material has a thickness of about 0.001 to 10 micrometers.

6. The microstructure of claim 1, wherein the framing material has a thickness of about 0.01 to 2 micrometers.

7. The microstructure of claim 1, further comprising a plurality of air-regions disposed within the overcoat layer, the framing material layer of each of the plurality of air-regions engaging at least a portion of each air-region on the inside surface of the framing material layer and engaging the overcoat layer on the outside surface of the framing material layer.

8. The microstructure of claim 7, wherein the air-regions are positioned at multiple height levels within the overcoat layer.

9. The microstructure of claim 8, wherein a first air-region is positioned above and substantially in-line with a second air-region.

10. The microstructure of claim 8, wherein a first air-region is positioned above and substantially offset from a second air-region.

11. A microstructure, comprising:

a substrate;

an overcoat layer disposed upon the substrate;

a sacrificial polymer layer disposed within at least a portion of the overcoat layer; and

a framing material layer engaging at least a portion of the sacrificial polymer layer on an inside surface of the framing material layer and engaging the overcoat layer on an outside surface of the framing material layer.

12. The microstructure of claim 11, wherein the overcoat layer is selected from polyimides, polynorbornenes, epoxides, polyarylenes ethers, parylenes, inorganic glasses, and combinations thereof.

13. The microstructure of claim 11, wherein the framing material is selected from SiO_2, Si_3N_4, SiO_xN_y (where x is from 0.01 to 2 and y is from 0.01 to 1.33), and Al_2O.

21. The method of claim 18, wherein the framing material is selected from SiO_2, Si_3N_4, SiO_xN_y (where x is from 0.01 to 2 and y is from 0.01 to 1.33), and Al_2O.

22. The method of claim 18, wherein the sacrificial layer polymer is selected from polyimides, polynorbornenes, epoxides, polyarylenes ethers, polyarylenes, inorganic glasses, and combinations thereof.

23. A method for fabricating a microstructure, comprising:

providing a structure having a substrate, an overcoat layer, a sacrificial polymer layer in an area within the overcoat layer, and a framing material between at least a portion of the sacrificial polymer layer and the overcoat layer; and

removing the sacrificial polymer layer to form an air-region within the area defined by the sacrificial material.

24. The method of claim 23, wherein the sacrificial layer polymer is solvent-incompatible with the overcoat.

14. The microstructure of claim 11, wherein the sacrificial layer polymer is selected from polyimides, polynorbornenes, epoxides, polyarylenes ethers, parylenes, inorganic glasses, and combinations thereof.

15. The microstructure of claim 11, wherein the sacrificial layer polymer is solvent incompatible with the overcoat.

16. The microstructure of claim 11, wherein the sacrificial layer polymer has a height from about 0.01 to 100 micrometers and a width of about 0.1 to 10,000 micrometers.

17. The microstructure of claim 11, wherein the framing material has a thickness of about 0.001 to 10 micrometers.

18. A method for fabricating a microstructure, comprising:

providing a substrate having a sacrificial polymer layer disposed thereon;

disposing a framing material onto at least a portion of the sacrificial polymer layer; and

disposing an overcoat layer onto the framing material, wherein the framing material substantially separates the sacrificial polymer layer from the overcoat layer.

19. The method of claim 18, further comprising:

removing the sacrificial layer to define an air-region within the overcoat layer, the framing material engaging at least a portion of the air-region on an inside surface of the framing material and engaging the overcoat layer on an outside surface of the framing material.

20. The method of claim 18, wherein the overcoat layer is selected from polyimides, polynorbornenes, epoxides, polyarylenes ethers, parylenes, inorganic glasses, and combinations thereof.